

Pennsylvania PDMP EHR and Pharmacy System Integration Evaluation

Pennsylvania Department of Health's Integration Strategy

In 2017, the Pennsylvania (Pa.) Department of Health's (DOH) Prescription Drug Monitoring Program (PDMP) Office developed a strategy to increase healthcare providers' utilization of the PDMP within their clinical workflows. Specifically, Pa. DOH initiated a process to integrate the PDMP system into the electronic health records (EHR) of authorized healthcare entities (HCEs), including hospitals, health systems, private practices, and pharmacies in Pa. The aim was to streamline prescriber access to PDMP information by integrating a link to an automated patient search within the EHR system (i.e., within a page of each patient's EHR). The guiding theory was that the integrated link would provide a reminder to check the PDMP and streamline access to the PDMP, which would increase PDMP use prior to prescribing opioids and result in better and safer clinical decision-making.

Pa. DOH gathered information on HCEs in order to collect integration requests, prioritize and plan integration, and make contact with interested HCEs. The PDMP office prioritized integration for HCEs based on the following criteria:

1. The type of EHR system utilized and the vendor's readiness to integrate,
2. Number of prescribers/dispensers (hereafter, referred to as "providers") employed by the HCE,
3. Resources and readiness of the HCE,
4. Healthcare area/specialty, and
5. Severity of opioid crisis in the county,

emphasizing (1) EHR vendor readiness, (2) greater number of providers, including all health systems, and (3) readiness of the HCE. The Pa. PDMP Office offered direct integration¹ to prioritized HCEs, and then onto all HCEs.

Direct integration, in which providers click a button to search the PDMP rather than opening a new screen, logging into the PDMP website, and typing in patient name, date of birth, and report date range, began in December 2017 for HCEs with the highest priority scores. Rollout to HCEs throughout Pa. is ongoing at the writing of this report. To date, only direct integration with EHR systems has occurred; integration with health information exchange² is planned for the future.

Evaluation Methods

Public Health Management Corporation's (PHMC) Research & Evaluation Group (REG) conducted an evaluation of EHR system integration to provide the Pa. DOH with information regarding the success of the initiative. The evaluation team developed and distributed a brief 5-minute survey designed to evaluate provider perceptions of the PDMP prior to and following integration. We emailed a survey link to individuals employed at HCEs that were integrated between December 1, 2017 and January 31, 2019. The 17 item survey asked respondents to provide information about their experiences before and after integration in the following areas:

1. Providers use of a delegate to search the PDMP,
2. Time spent searching in the PDMP system,
3. Clinical impact,
4. Patient rapport and workflow,

¹ **Direct integration** is the integration method in which the HCE would integrate with the PDMP system directly, from within the patient's EMR record.

² **Health information exchange (HIE) integration** is the integration method in which the HCE would access the PDMP through the Pennsylvania Patient & Provider Network, Pa.'s secure health information exchange. Pa. DOH collected whether the HCE is on the HIE in the event that HIE integration becomes available in the future.

5. Overall satisfaction with PDMP system, and
6. Search efficiency and prescribing behavior.

PHMC utilized information provided by Pa. DOH (i.e., providers name, email address, HCE, their role, NPI number, Pa. professional license number, date of EHR integration) to email the survey link to providers whose EHR systems were directly integrated with the PDMP system. The survey was initially distributed on 2/27/19 and was closed on 3/15/19 after sending three reminder email messages at strategically varied times of day and week. Overall, 22,132 individuals were invited to complete the survey. Delivery statistics from the online survey platform indicated that 433 of the emails bounced and 193 people unsubscribed from receiving further survey emails; 16 people contacted PHMC with reasons why they did not complete the survey (e.g. no longer worked for HCE, wrong person, did not believe PDMP was integrated with their EHR). In total, 1,535 individuals opened the survey (6.9% engagement rate); of those people 128 partially completed the survey and 1,407 answered all applicable questions. First, we asked respondents if they are currently a registered user of the PDMP; 56 indicated they were not registered and had no further questions to answer. Individuals who were not registered as a user of the PDMP prior to EHR integration only answered the survey questions about their EHR after integration and were excluded from the final sample. Similarly, respondents who indicated that a delegate always conducted searches of the PDMP were not asked the follow-up questions and were only included in the final sample for analyses regarding delegate use before and after integration. The final sample for questions regarding perception and behavior before and after integration consisted of the 979 respondents who completed the entire survey. Table 1 describes the types of HCEs represented in the sample.

Table 1. HCE type for analytic sample.

HCE type	n	(%)
Group practice	29	(3.0)
Health system	815	(83.2)
Independent hospital	113	(11.5)
Independent practice	22	(2.2)

Outcomes

Delegate use. This ordered categorical outcome reflected how often the provider reported using a delegate to search the PDMP prior to and following integration. Response options were reported on a 7-point scale with the following anchors: Never (0%), Rarely (10%), Occasionally (30%), Sometimes, (50%), Frequently (70%), Usually (90%), Every time (100%).

Search time. This open-ended continuous outcome reflects how long on average providers reported it taking them to search results for a given patient prior to and following integration. Responses were grouped into two-minute intervals. Respondents providing responses in excess of 1200 seconds (i.e., 20 minutes corresponds to a standard appointment duration) or who provided a verbal rather than numeric response were excluded from the analysis.

Use of PDMP to develop care plans. Respondents reported how often they search the PDMP prior to developing a patient care plan that involved prescribing opioids or benzodiazepines or providing refills for these medications using a Likert scale from 1 to 7 where 1 reflected “strongly disagree” and 7 reflected “strongly agree.”

Clinical impact score. A Clinical Impact Score was created using responses to three Likert-scale items that assessed provider perceptions of how EHR integration positively impacted their workflow. These items

asked providers to what extent they agreed with: 1) “it is easy to search the PDMP before and during a clinical visit (while a patient is waiting)” (Clinical Care), 2) “conducting PDMP searches negatively impacted my rapport with the patient” (Rapport), and 3) “conducting searches gets in the way of my workflow during clinical visits” (Visit Workflow). Rapport and Visit Workflow were reverse scored. The three items were found to have acceptable internal consistency prior to EHR integration (Cronbach’s $\alpha = .74$) and after (Cronbach’s $\alpha = .84$). For pre-integration items, the item-total correlations were .57 for Clinical Care, .50 for Rapport, and .64 for Visit Workflow. For post-integration items, the item-total correlations were .67 for Clinical Care, .69 for Rapport, and .78 for Visit Workflow.

Data Analysis

Descriptive statistics were calculated to describe respondents’ PDMP registration status, use of delegates, search practices, and satisfaction with EHR integration. For items in which respondents provided opinions before and after integration, we examined changes in perceptions as a result of EHR integration using a McNemar-Bowker chi square analyses for the categorical variable (i.e., delegate use) and dependent t-tests for continuous and Likert-scaled items (i.e., search time, use of PDMP to develop care plans, and clinical impact scores). All descriptive and inferential data analyses were performed using SPSS.

Evaluation Results

Search time. Participant open-ended responses to the item “On average, how long (in seconds) did it take you to look up and find results for a given patient before/after integration?” are presented in Table 2 below for both before and after integration.

Table 2. EHR search time (in seconds).

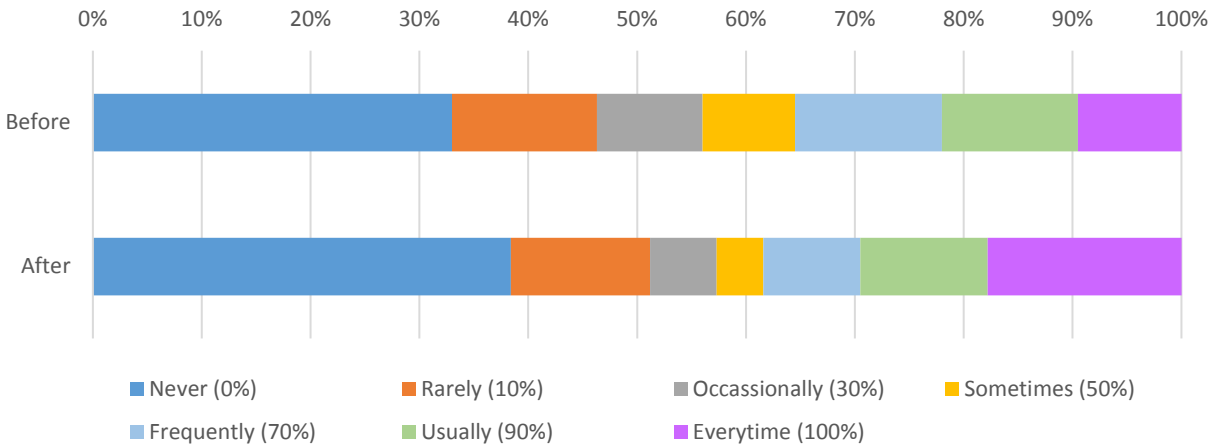
Time Range (Seconds)	Before		After	
	n	(%)	n	(%)
0-120	677	(71.1)	884	(92.6)
121-240	148	(15.7)	46	(4.7)
241-360	103	(10.8)	16	(1.7)
361-480	6	(0.6)	1	(0.1)
481-600	15	(1.6)	3	(0.3)
601-720	1	(0.1)	0	
721-840	0		0	
840-960	0		0	
960-1080	0		2	(0.2)

* Note: Respondents who indicated longer than 1200 seconds or gave verbal rather than numeric responses were excluded from analysis.

As seen in Table 3, results of the dependent t-test indicated that there was a significant difference in the amount of time providers searched the PDMP prior to integration ($M = 128.40$, $SD = 106.90$) and after integration ($M = 47.87$, $SD = 79.32$), $t(939) = 22.96$, $p < .0001$. The search time reported by providers after integration was substantially less than the search time reported prior to integration.

Delegate use. Participant responses to the item “How often do you use a delegate to search the PDMP?” are presented in Figure 1 below.

Figure 1. How often do you use a delegate to search the PDMP?

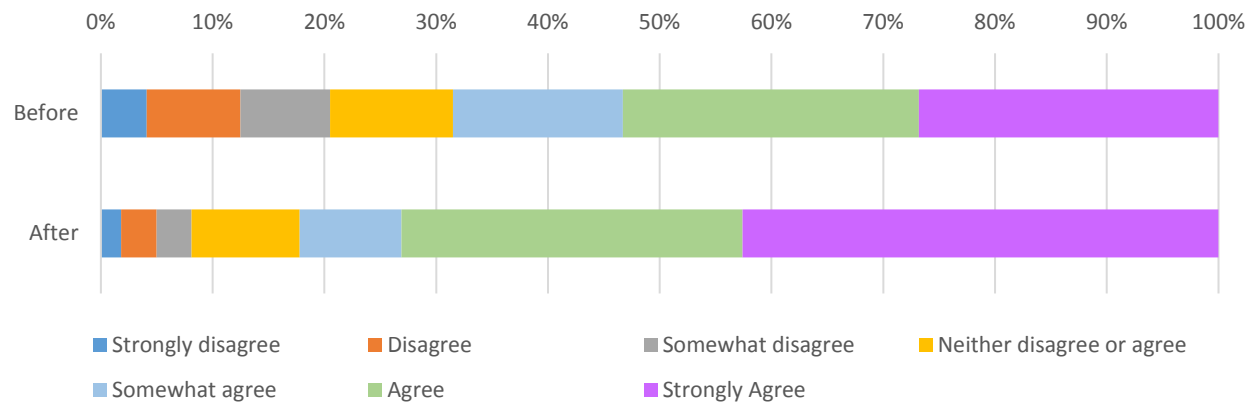


Prior to EHR integration, a third of users reported that they had never used a delegate to search the PDMP (n = 408, 33.0%). The next largest group (n = 167, 13.5%) reported frequently using a delegate. Furthermore, 13.3% (n = 164) rarely used a delegate, 9.7% (n = 120) occasionally used a delegate, 8.5% (n = 105) sometimes used a delegate, 12.5% (n = 12.5%) usually used a delegate, and 9.5% (n = 117) used a delegate every time. After EHR integration, the two largest groups were providers who reported never using a delegate to search the PDMP (n = 474, 38.4%) and those who reported using a delegate every time (n = 220, 17.8%). Additionally, 12.8% (n = 158) rarely used a delegate, 6.1% (n = 75) occasionally used a delegate, 4.3% (n = 53) sometimes used a delegate, 8.9% (n = 110) frequently used a delegate, and 11.7% (n = 145) usually used a delegate.

A McNemar-Bowker chi square analysis indicated a significant difference between pre- and post-integration use of delegates to search the PDMP, $\chi^2(21) = 146.45$, $p < .0001$. As seen in Figure 1, more respondents reported consistent methods (i.e., reflected in more always and never responses) following EHR integration.

Use of PDMP to develop care plans. Participant responses to the item “I always search the PDMP prior to developing a patient care plan that involved prescribing opioids or benzodiazepines or providing refills for these medications” are presented in Figure 2 below.

Figure 2. I always searched the PDMP prior to developing a patient care plan that involved prescribing opioids or benzodiazepines or providing refills for these medications.



Prior to EHR integration, slightly over half of providers either agreed ($n = 258$, 26.5%) or strongly agreed ($n = 261$, 26.8%) that they always searched the PDMP prior to developing a patient care plan that involved prescribing opioids or benzodiazepines or providing refills for these medications. Furthermore, 15.2% ($n = 148$) somewhat agreed, 11.0% ($n = 107$) neither disagreed nor agreed, 8.0% ($n = 78$) somewhat disagreed, 8.4% ($n = 82$) disagreed, and 4.1% ($n = 40$) strongly disagreed.

After EHR integration, a large majority agreed ($n = 299$, 30.5%) or strongly agreed ($n = 417$, 42.6%) that they always searched the PDMP before developing a patient care plan involving opioids, benzodiazepines, or refills for these medications. Additionally, 9.1% ($n = 89$) somewhat agreed, 9.7% ($n = 95$) neither disagreed nor agreed, 3.1% ($n = 30$) somewhat disagreed, 3.2% ($n = 31$) disagreed, and 1.8% ($n = 18$) strongly disagreed.

Results from the dependent t-test indicated a significant difference in how much providers agreed that they search the PDMP before developing a patient care plan prior to EHR integration ($M = 5.11$, $SD = 1.78$) and after integration ($M = 5.83$, $SD = 1.45$), $t(973) = -16.08$, $p < .0001$. On average, providers somewhat agreed that they always search the PDMP before integration, and agreed that they always search the PDMP after integration. Table 3 includes results from this analysis.

Clinical impact score. As seen in Table 3, providers agreed that their workflow was positively impacted by EHR integration with higher clinical impact scores following integration ($M = 5.20$, $SD = 1.38$) than before integration ($M = 3.29$, $SD = 1.33$); $t(976) = -35.54$, $p < .0001$.

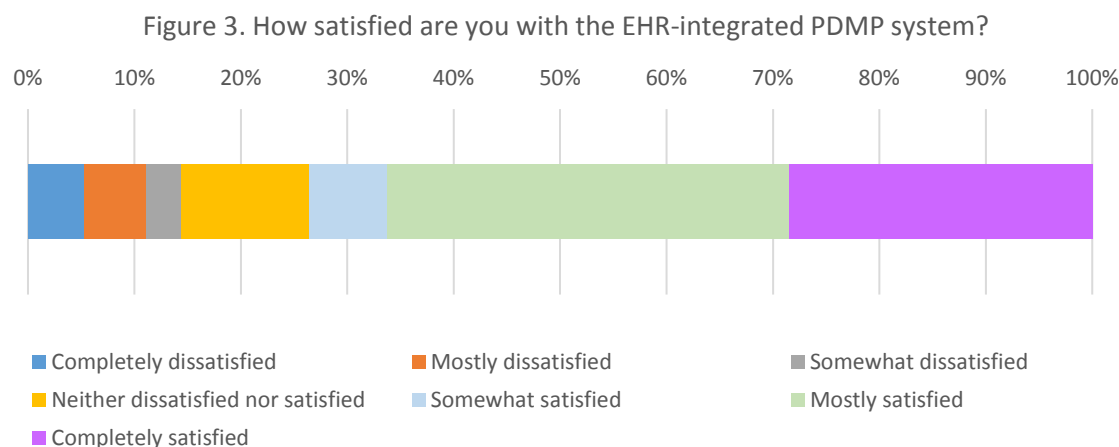
Table 3. Dependent T-Test Results

Variable	Time point	M	SD	Range	t
On average, how long (in seconds) did it take you to look up and find results for a given patient before (and after) integration? (n = 940)	Pre	128.40	106.90	0-650	22.96*
	Post	47.87	79.32	0-1000	
I always search the PDMP prior to developing a patient care plan that involved prescribing opioids or benzodiazepines or providing refills for these medications. (n = 974)	Pre	5.11	1.78	1-7	-16.08*
	Post	5.83	1.46	1-7	
Clinical impact score** (n = 977)	Pre	3.29	1.33	1-7	-35.54*
	Post	5.20	1.38	1-7	

* $p < .0001$

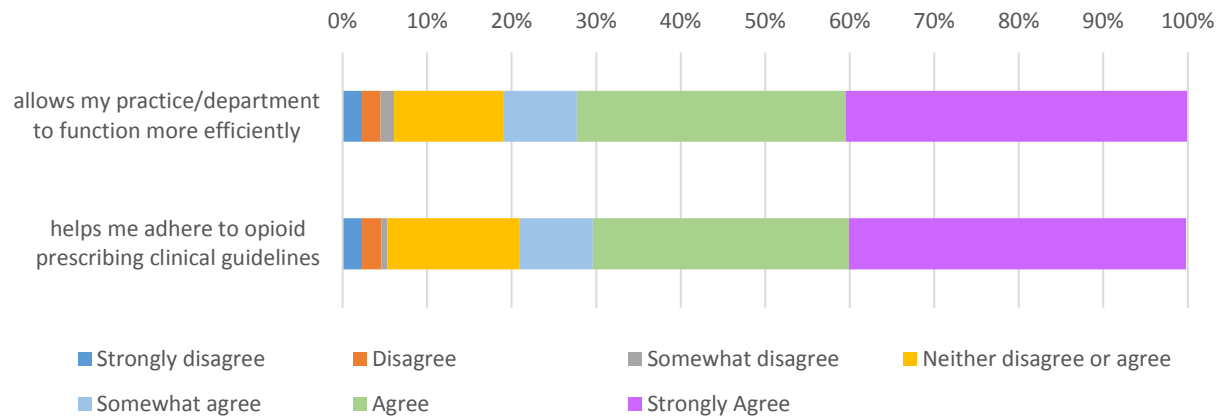
**Note: This scale is comprised of the following 3 Likert-scaled items: It is easy to search the PDMP before/during a clinical visit [while the patient is waiting]; Conducting PDMP searches gets in the way of my workflow during clinical visits; Conducting PDMP searches during clinical visits negatively impacts my rapport with the patient.

Satisfaction with EHR-integrated PDMP system. As seen in Figure 3 below, providers reported high levels of satisfaction with the EHR-integrated PDMP system. The majority of providers were either mostly satisfied (n = 370, 37.8%) or completely satisfied (n = 279, 28.5%) with the EHR-integrated PDMP system.



As seen in Figure 4 below, most providers either agreed or strongly agreed that having the PDMP integrated into the EHR system allowed their practice or department to function more efficiently (n = 707, 72.2%) and helped them adhere to opioid prescribing clinical guidelines (n = 688, 70.2%).

Figure 4. Compared to the stand-alone, non-integrated PDMP, having the PDMP integrated into our EHR system.



Conclusions

Findings from this survey suggest that providers had very positive experiences using the integrated PDMP system. They reported significant reductions in the time it takes them to search the PDMP and more consistent delegate use following EHR integration. Providers also reported that the integrated system helped them to provide better clinical care to patients. Specifically, they felt that the integration system did not negatively impact important aspects of care such as work flow, patient rapport, and efficiency. Perhaps most importantly, approximately 70% of providers agreed or strongly agreed that the integrated PDMP system helped them to adhere to the opioid prescribing guidelines. This finding suggests that integration may be necessary in order to achieve one of the primary objectives of the PDMP initiative.

Discussion

We found that provider more consistently used delegates to conduct patient searches on the PDMP – either reporting that they now never use delegates or now always use delegates. We had expected that providers would report generally using delegates less often following integration. This finding was unexpected but perhaps logical. For providers who began using delegates less often after EHR integration, EHR integration may have removed prior barriers to providers incorporating PDMP searching into their workflow, allowing them to search the PDMP for the relevant patients amidst patient visits. For providers who began using delegates more often to conduct patient searches on the PDMP, EHR integration may have served as a nudge to providers to systematically incorporate PDMP searches into their workflow more generally. Importantly, consistent use of one strategy is some indication that a provider has incorporated patient searches on the PDMP into their workflow – whether they choose a time efficient method (i.e., searching within the EHR) or a cost efficient method (i.e., a delegate searching the PDMP manually).

Limitations

This evaluation has several limitations. First, the pre-test questions were asked retrospectively following integration. For this reason, responses may be subject to recall bias. For example, providers may be more accurate in their reporting of how long it now takes (post-integration) to search the PDMP than how long it took six months ago to search the PDMP (pre-integration). Optimally, one would evaluate perceptions at two occasions—prior to integration and following integration. However, we were not

able to do this in the current evaluation due to logistics. Second, providers completed the survey at varying times following EHR integration. In addition to the effects of this related to recall bias, providers who were integrated more recently may have had less time to experience the full impact of integration than those who had been using the integrated system for a longer period of time. Third, the outcomes evaluated were obtained through self-report. In the absence of provider PDMP search and prescribing data, we were not able to objectively verify that the integration had impacted the provider behavior to the extent they reported. Finally, the survey had a low response rate. For this reason, the survey sample may not be representative and, consequently, the results we found on the impact of PDMP integration may not be generalizable to all providers in these HCEs.

Recommendations

Findings from this evaluation provide strong support for the utility of integrating the PDMP into the EHR system and underscore the importance of continuing integration efforts.

Despite overwhelmingly positive perceptions of the integrated system within the evaluation sample, a portion of providers who completed the survey are not fully engaged with the PDMP system, are not satisfied with it, and/or are not using it in the development of patient care plans. Future efforts should focus on collecting more in-depth information from these individuals to identify ways to improve the utility of the PDMP more broadly.

Finally, it is critical that future efforts identify the impact of integration on objective provider behaviors that are captured by the system. These behaviors would include, but are not limited to, PDMP utilization (e.g., number of patient searches conducted, amount of time spent) and opioid prescribing (e.g., number of patients with opioid prescriptions, average opioid dosage per prescription, average day's supply).